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Monitoring and Protecting of Crops from Wild Animals Using IOT

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Abstract—

The coexistence of agriculture and wildlife presents challenges for farmers worldwide, as wildlife intrusion poses a significant threat to crop yield and quality. Traditional methods of mitigating these risks often prove ineffective or unsustainable. To address this issue, an Internet of Things Io T-enabled system for monitoring and protecting crops from wild animals has been developed. This system integrates various IoT components such as sensors, actuators, and communication devices to create a comprehensive crop security network. Sensors deployed across the agricultural landscape continuously monitor environmental parameters, detecting the presence of wild animals through motion, sound, or infrared signatures.Upon detection, the system triggers appropriate responses, such as activating deterrent devices or sending alerts to farmers via mobile applications. Machine learning algorithms are employed to analyze sensor data and identify patterns indicative of potential wildlife threats. This enables proactive measures to be taken, such as preemptive deployment of deterrents in high-risk areas or adjusting security protocols based historical intrusion patterns. This system offers several advantages over traditional approaches. It provides real- time insights into wildlife activity, allowing farmers to respond promptly and effectively to potential threats. Additionally, by leverage automaton and data analytic, the system optimizes resource allocation and reduces false alarms, thereby enhancing overall efficiency and cost- effectiveness. This research demonstrates the potential of IoT technology to revolutionize crop security management, offering farmers a sustainable and scaleable solution to mitigate the impact of wildlife intrusion agricultural productivity.

Keywords—IOT, Arduino, PIR Sensor, Soil Moisture Sensor, Temperature sensor, Microcontroller,YOLO V5

1. INTRODUCTION

In agricultural regions, the intrusion of animals into crop fields poses a significant threat to food security and farmers' livelihoods. Traditional methods of deterring animals are often labor- intensive, ineffective over long periods, or harmful to the animals and environment. To address this challenge, this project proposes a smart, humane, and efficient solution leveraging gcutting- edge technology. The project aims to develop an automated system that utilizes the YOLOv5 algorithm for real- time animal detection, enabling immediate action through non-lethal repellent measures. Upon detecting intruding animals, the system will notify farmers via mobile notifications and activate a series of deterrents, including LED lights, auditory warnings, and physical movements. These deterrents are designed to safely scare away intruders without causing harm to them .By combining advanced computer vision with non-lethal deterrent measures, the proposed system offers a humane and effective solution to mitigate animal intrusion in crop fields. It not only enhances food security and protects farmer’s livelihoods but also promotes

coexistence between humans and wildlife while minimizing environmental impact.

2. RELATED WORK

Animal infiltration is a serious danger to crop yield, which has an impact on food security and lowers farmer profits. The Internet of Things and machine learning techniques are being developed in this proposed model's answers to this issue. The ESP8266 Wireless Fidelity module, Pi Camera, Buzzer, and LED are all interfaced with the machine algorithm, which is run on the Raspberry Pi. To identify objects in photos and categories the animals, machine learning algorithms like Single Shot Detection and Region- based Conventional Neural Networks are crucial. The results of the experiment show that Single Shot Detection outperforms Region-based Conventional Neural Network technique. Finally, the software that integrates with the Twilit API decimates the information so that farmers can act swiftly in their farm fields.

IOT technology to prevent wild boar damage to crops. When animals leave and enter protected areas, problems between people and wildlife arise, and crop raiding is one of the biggest issues globally. Several huge species, including elephants and wild boars.

Which consume a lot of crops and pose a threat to people, are most common in mountainous and hilly areas. The proposed system helps by using sensor detection to keep an eye on current events using PIR and ultrasonic sensors, as well as a Node MCU to deliver active external mitigation to prevent animals from entering farms. The IFTTT software platform also aids in Node MCU's ability to alert farmers via text message. Hence, the system offers total control over stopping and changing farmers at the same time without requiring any human contact, even at night.

Crop protection, and fertilizer forecasting. IoT sensors send data about agricultural fields, which are then acted upon based on input from the user. The idea of "smart agriculture" is developing. The creation of a system that can track temperature maintained by applying only the necessary amount of fertilizers, which will also boost the soil's production. In order to safeguard the crop from animals, the motion sensor will sound

3. Methodology

The whole structure of the proposed system is as shown in Fig.l.

Protecting crops from wildlife can be approached through various methods, often combining preventive measures, deterrents, and sometimes humane intervention. Here's a methodology that encompasses several strategies.

Field Observation and Assessment: Regularly monitor the fields to identify signs of wildlife intrusion. This can include tracks, droppings, damage patterns, and sightings, Assess the types of wildlife causing damage and their patterns of behavior.

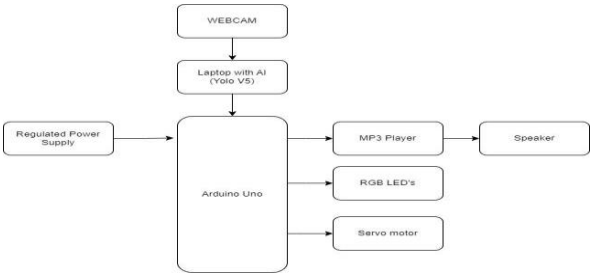

Fig.1. Block Diagram

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3.1. PIR SENSOR

All living objects, whose body temperature is more than 0oC, emit the heat in form of infrared radiation through their body, also called as thermal radiations. This Radiated energy is invisible to human eye. These Signals can be detected by using PIR sensor which is specially designed for such purpose

Fig.2: PIR SENSOR

Passive Infrared: PIR sensors are passive devices that detect changes in infrared radiation without emitting any themselves. Occupancy Sensing: PIR sensors are often used to determine occupancy in spaces for various applications such as lighting control and energy management .Security Systems: PIR sensors play a vital role in security systems by detecting intruders or unauthorized movement .Automatic Lighting: PIR sensors trigger lighting systems to turn on or off automatically based on detected motion, enhancing energy efficiency and convenience

SOIL MOISTURE SENSOR

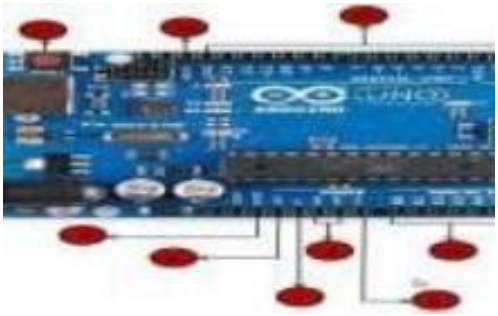

Fig.3: SOIL MOISTURE SENSOR

Soil clamminess sensors recognition the volumetric water content in soil. Since the direct gravimeter estimation of loosened soil moistness requires wiping out, drying, and weighting of a case, soil suddenness sensors degree the volumetric water content texture indirect by utilizing the utilization of some specific possessions of the tidy, containing electrical opposition, dielectric tenacious, or exchange with neutrons, as a mediator for the clamminess content material texture. The relationship some of the arranged assets and soil suddenness must be adjusted and would variety be able to dependent upon environmental added substances, for instance, soil kind, temperature, or electric fueled controlled conductivity. Considered microwave radiation is roused with the guide of the utilization of the earth moistness and is actualized for identifying in hydrology and cultivating3.3. SIM 800L GSM Module

The SIM800L is a GSM module from Simcom that gives any micro-controller GSM functionality, meaning it can

connect to the mobile network to receive calls and send and receive text messages, and also connect to the internet using GPRS, TCP, or IP. Another advantage is that the board makes use of existing mobile frequencies, which means it can be used anywhere in the world.

Fig 4 DHT11 SENSOR

Digital Humidity and Temperature sensor is a readymade module which is used to observe humidity and temperature by interfacing arduino microcontroller. We use dht library for interfacing module, with the help predefined functions we observe humidity and temperature values.

3.2. LCD

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LED's have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.

Fig 5 LCD

3.1. SPEAKER

Regardless of their design, the purpose of speakers is to produce audio output that can be heard by the listener. Speakers are transducers that convert electromagnetic waves into sound waves. The speakers receive audio input from a device such as a computer or an audio receiver

Fig 6: Speaker

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3.6 RELAY

Relays are switches that open and close circuits elelectronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

Fig 7 RELAY

4. Results & Discussion

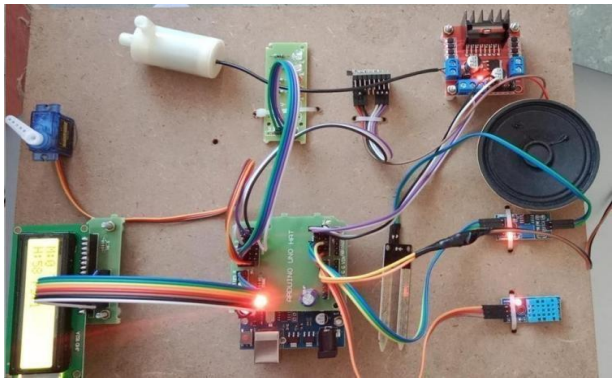

Fig 8 System Hard ware

The prototype shown in Fig is a collection of tools and devices designed to help farmers monitor and protect their crops more effectively. This kit typically includes a range of sensors and other hardware components, along with accompanying software for data analysis and decision- making. Here's a description of the key components typically found in such a kit and their functions:

Soil Sensors: Soil sensors measure soil pH, nutrient levels, salinity, and other soil properties. They help farmers optimize soil conditions for crop growth and detect any deficiencies or imbalances that may affect plant health.

Fig 9 Displaying Temperature and Humidity

4. Conclusion & Future scope

In conclusion, the proposed two-level vehicle access control system represents a significant advancement in vehicle security and driver safety. By integrating advanced authentication mechanisms, real-time monitoring capabilities, and proactive security features, the system offers robust protection against theft, unauthorized access, and alcohol-related incidents. The multi-layered approach to security, including RFID and fingerprint authentication, GSM notifications, and alcohol detection, ensures comprehensive protection for vehicles and their occupants.

Overall, the vehicle access control system offers a versatile and comprehensive solution for enhancing vehicle security, promoting driver safety, and ensuring regulatory compliance. By addressing the challenges of unauthorized access, theft, and alcohol-related incidents, the system contributes to safer roads, more secure communities, and greater peace of mind for vehicle owners and users alike. As technology continues to evolve, the integration of advanced security features into vehicle access control systems will play a crucial role in shaping the future of transportation and mobility.

The present module can be interfaced with GPS module to find out vehicle location and a camera to captured the person through mobile application.

The future scope of the project involves continuous innovation and adaptation to emerging technologies, regulatory requirements, and user needs to ensure its effectiveness and relevance in the rapidly evolving landscape of vehicle security and authentication systems.

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